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BORDEN'S REVIEW *of* NUTRITION RESEARCH

THE NATIONAL INDUSTRIAL NUTRITION PROGRAM

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THE NATIONAL INDUSTRIAL NUTRITION PROGRAM

The nutrition in industry program is an integral part of a national program which had its beginnings in May, 1941 with the holding of the National Nutrition Conference in Washington, D. C. National concern with problems of nutrition was intensified as a result of the rapidly increasing number of authoritative reports on the widespread prevalence of malnutrition, and was further stimulated by the present war which, because of its attendant complications of food supply and distribution, has served to establish the immediacy of the nutrition problem. Through the Committee on Nutrition in Industry of the National Research Council and its branch state committees and local subcommittees, an extensive survey of nutrition conditions among war workers was begun in 1941. The findings of these committees have revealed a considerable incidence of dietary inadequacy among this large group of our civilian population.* The aim of the national industrial nutrition program is to ameliorate this situation by suggesting and establishing improved feeding practices for war workers as a means of improving their health and morale and, consequently, of increasing their productive capacity and efficiency.

Experimental Findings:

The value of an adequate, well-balanced diet as an essential to buoyant health is well known. In the case of persons engaged in strenuous physical labor, it has been pointed out that certain nutrients, notably the B complex vitamins, assume added significance because of their direct influence on work capacity, susceptibility to fatigue, irritability, and efficiency (1, 2, 3). Other vitamins and minerals are thought to be needed in heightened amounts under unusual conditions of exposure to heat, strain or industrial toxins. In order to bolster the normal, usually inadequate, diet of the average worker, as well as to contribute to the heightened nutritional needs imposed by certain arduous working conditions such as those just enumerated, nutrition authorities have suggested the adoption of between-meal feedings as a means of increasing the well-being and productivity of workers.

Supplementary Feeding: In 1927, Haggard (4) pointed out that a decrease in available carbohydrate, as indicated by lowered concentration of sugar in the blood, might be responsible for the feeling of tiredness, irritability and decreased work capacity experienced by many industrial and office workers in the late morning or late afternoon. This fact, as well as the early studies of Krogh and Lindhard

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*cf. *Borden's Review of Nutrition Research*, April, 1945—"Nutrition in Industry."

(5) indicating that men on a low carbohydrate diet exhibit early fatigue and decreased efficiency in muscular work, led Haggard to suggest the practice of between-meal feeding of easily digestible carbohydrate foods. Because such snacks may form a substantial part of the diet as a whole and because the diet of industrial workers is ordinarily deficient in vitamins and minerals, Greenberg and Haggard (6) suggested that between-meal foods should provide not only carbohydrate, but adequate amounts of other essential nutrients.

More recently, Thorn *et al* (7) recommend the intake of a high protein breakfast, rather than the typical high carbohydrate usually consumed, as a means of preventing midmorning fatigue due to hypoglycemia, particularly if facilities for between-meal snacks are not available. They cite Conn and Newburgh's (8) experiments with human subjects which demonstrated that blood sugar levels fluctuate rather widely following high carbohydrate meals, but are relatively stable after high protein meals. Thorn *et al* suggest, therefore, the increased use of high protein foods such as milk, cottage cheese, nuts and soybean products in breakfast meals.

The most satisfactory food combinations providing liberal amounts of essential vitamins and minerals, as well as the needed carbohydrate were found to be milk and cake or milk and bananas. Other suitable, easily available foods include cheese, ice cream, meat, fortified peanut butter, pastry enriched with brewers' yeast, fruit juices and the like. These are easily dispensed, leave little or no residue and appeal to almost all tastes.

In 1935, Haggard and Greenberg (9) reported the results of a two-year study of the influence of between-meal feeding upon the rate of production among factory workers. Production of individual workers was determined by counting the number of shoe tops sewed hourly. For this study forty operators were divided into two groups of twenty each. One group served as controls and the other as the experimental group. Their production records were studied simultaneously for ten weeks. During this time the control group ate their accustomed three meals a day while the experimental group, intermittently on two-week shifts, had mid-morning and mid-afternoon supplements of milk and cake. The hourly average for the three-meal group was approximately 183 shoes, and practically constant from period to period. The output of the experimental group fluctuated greatly. Productivity increased directly with the addition of the milk and cake, the average increase ranging from 17 to 19 shoes per hour per operator during the supplementary feeding period. The authors point out that the operators in the experimental group were actually less skilled than those in the control group.

In the same year, Comstock and Eddy (10) reported a reduction in industrial absenteeism and improvement in disposition and well-

being among employees following the introduction of supplementary luncheons at the time of the usual rest periods. Similar effects were reported in a subsequent experiment by Haggard and Greenberg (11) on a large group of clerical workers.

From a survey of several hundred industrial plants in 21 states, the following general reports were received concerning the value to employers of between-meal milk service (12) : fewer absences, shorter absences, greater accuracy, increased efficiency, less sickness, less fatigue, sustained energy, more cheerful attitude, more cooperative attitude, fewer colds, generally better health and promotion of good will.

Rehabilitation by Diet: In extreme instances of malnutrition which, fortunately, are relatively uncommon compared to the widely prevalent sub-clinical conditions, persons have been found to be so debilitated as to be physically unable to work. Spies (13) at the Hillman Hospital in Alabama, recently reported on the treatment of one hundred selected individuals many of whom were so severely ill as to be unable to walk or stand alone, too weak to even feed themselves, or suffering from such severe pain as to be unable to eat or move. Others had developed alarming psychotic manifestations and became listless, disoriented or even violent. Many of these people had been to physicians who had at first erroneously attributed the flagrant signs of deficiency disease to other illnesses such as scarlet fever, nephritis, or multiple sclerosis (lesions of the brain or spinal cord) . When these patients were finally brought to the Hillman Hospital, where facilities for thorough diagnosis are available, these alarming conditions were all traced to severe nutritional deficiency. The following excerpted case history, describing the more severe manifestations of extreme malnutrition, illustrates the dramatic response to therapy with nutritious foods and vitamin supplements:

History—K. J., a 33-year-old foundry worker, was brought to the Hillman Hospital by his wife on March 16, 1936. The patient had been in good health until January 1936. We learned that he was a skilled, reliable worker, exceptionally conscientious, and one of the best molders in the foundry. He was made foreman when he was only 23 years of age. He married and began making payments on a small house and one-half acre of land. Within three years three children were born, and in order to provide them with the best food possible he bought a cow and chickens and grew vegetables and fruit, much of which his wife canned for winter use. The family lived comfortably and had a liberal and well-balanced diet. By 1931 the mill had closed and he was out of a job. His savings disappeared. He sold the cow and chickens when he could no longer buy food for them. Occasionally he obtained work but earned only enough to provide a little milk for the children, scant fuel for the stove and some seeds for the garden. He worried about his wife and children and decided that in order to give them the best of what food there was he would tell them he preferred grits, corn bread and syrup. He followed this self-imposed diet and gradually lost all desire for food. For days he ate biscuits and drank coffee in an attempt to get enough energy to work in the garden. In January 1936 his wife observed that he was doing very peculiar things, such as getting up at night and pacing the floor or walking around the garden, hours at a time, talking or mumbling to himself. He was confused and in the middle of a sentence frequently forgot what he had started to say. When he went on an errand he often forgot where he had started and for what purpose. Although he had always been devoted to his family, he became so irritable that the children were afraid of him and his wife hid them from him. Although he could not tolerate having the children

near him, he refused to allow them to go to school because they did not have the proper clothing. For the first time in his life he developed such a belligerent attitude toward his neighbors and friends that they stopped visiting him. He refused to go out of his house for weeks at a time. Early in February he began complaining of pain and burning in his stomach, and burning and aching of his feet. The burning was so intense that he could not sleep and he sat up most of the night with his feet in a tub of water; he refused to have bedclothes over them although the house was very cold. Later he began to complain of a sore mouth and tongue, and by this time the pain in his stomach was so severe that he refused to eat anything but thin gruel and to drink an occasional cup of coffee. Soon after his wife noticed that the skin on his hands, forearms and neck became fiery red. He thought he had something "catching" and issued orders that his wife and children must not enter his room. He lay in bed shouting that he had made a failure of his life and brought disgrace on his family, and he threatened to kill himself and them. He refused to have a doctor on the basis that the doctor would poison him and steal the children. His wife became so alarmed by his actions that she went to his former employer and asked assistance in having him committed to an institution for the treatment of mental diseases. The employer called a physician, who from the skin lesions made a diagnosis of pellagra and the patient was brought in an ambulance to the Nutrition Clinic of the Hillman Hospital.

Treatment and Course—He was placed under twenty-four hour nursing, dietetic and medical supervision. He was given daily a diet of 4,000 calories, rich in meat, milk and eggs, and 120 Gm. of dried brewers' yeast. Although he objected to taking food, complaining that it "scalded his tongue, burned his stomach and made his bowels move too often," by coaxing he was persuaded to eat the desired amount. Since he could eat only a little at one time, we fed him every hour day and night. He seemed rational at intervals during the first two days but most of the time he was having hallucinations and delusions, manifested by his insistence that his wife was waiting downstairs for him to sign a pay check, despite the fact that his wife was at home and that he had not received a pay check for a long time. Occasionally he thought we were trying to poison him, but this idea was fleeting; a few minutes after refusing food he might take the same food without hesitancy. By the third hospital day the redness of the tongue and the oral mucous membranes had disappeared. He said he felt fine, asked for food and volunteered that he had been "out of his head" for a long time. The skin lesions were fading and by the tenth day they had desquamated. The burning and aching of his feet steadily lessened, and he was discharged ten days after admission, having gained ten pounds. He had an excellent appetite, was cheerful, anxious to return home and felt confident of obtaining employment. He followed the recommended diet at home and visited us in the clinic twice during the next week. The superintendent of the foundry gave him work three days a week. The patient asked our counsel as to how to provide an adequate diet for himself and his family on his new income. He followed our suggestions and remained well until February 1938, when he developed a protracted illness. He lost his appetite and 20 pounds in weight. Three weeks after he noticed burning of the mouth and tongue, and burning and aching of the feet soon became so severe he could not sleep. He worried constantly about his family. His wife was sure he was going "out of his head" again. He was so depressed that he no longer cared for our counsel. His wife came to see us and we advised her to bring him to the hospital. He did not want to come. Two weeks later in a lucid moment he realized his symptoms were similar to those we had treated before, so he asked his wife to get a car to bring him again to the Nutrition Clinic.

Between these two attacks of deficiency disease the science of nutrition made rapid progress. Synthetic thiamine and nicotinic acid were now available and were administered in large doses along with the brewers' yeast and dietary recommendations. The patient remained ambulatory, coming to the Nutrition Clinic for treatment daily for the first three days, then twice a week for four weeks until all symptoms disappeared. Once again he was instructed to eat a liberal diet, but he objected because of the cost. He thought he would not be able to work for some time and feared that if he ate the recommended diet there would be no food for his family. He consented to follow instructions only when we told him he probably would be able to go back to work in a week if he followed directions. His former employer gave him several days' work each week, and within three months he was working six days a week as foreman. He continued until 1941, when he was offered a position in the Navy Yards. Since this paid more than the job he had, he decided to try it for a few months. After staying two months he found he enjoyed the work and came back, sold his house and moved his family. Although we made frequent examinations of the wife and children, we never found diagnostic lesions. Nevertheless they were underweight, nervous, irritable and apprehensive. As the patient's health improved and he obtained employment, he was able to provide a better diet for himself, his wife and his children. The general health of his wife and children as well as his own improved steadily. In his last letter he stated that he had not lost a day's work in over a year and that his family were in excellent health.

A total of one hundred persons thus debilitated solely by nutritional deficiencies were treated at the Nutrition Clinic with the result

that, in every instance, these persons recovered dramatically and were enabled to return to work. Being grateful and anxious to cooperate, most of these patients continued to follow the dietary advice given them with the result that a slow but steady improvement in their health, and frequently in that of their families occurred. These cases serve to illustrate the tremendous influence of diet on the availability of potential industrial manpower.

In less severe instances it has been reported that men rejected as unfit for military service because of malnutrition have been enabled to successfully pass the required physical examinations following a period of rehabilitation by good diet, rest and exercise. Crawford (13a) reports that after several months of such treatment, 87 per cent of a group of 834 rejected recruits were enabled to pass physical tests which they had previously failed.

Vitamin Concentrates:

The ready availability of the major vitamins in pure or concentrated form, as well as their comparative inexpensiveness, have led to their increasing use by industrial concerns in the hope of improving the health and vitality of their employees. There are two opposing schools of thought on the advisability of supplementing workers diets with vitamin concentrates. Those who advocate the practice cite the facts indicated by surveys that a large part of the populace, many of whom are industrial workers, do not obtain sufficient vitamins to maintain good health; that such sub-optimal health is reflected in poor work performance, easy fatigue, increased absenteeism. Further, since vitamins are relatively inexpensive and harmless in the usual dosages, it is believed that such supplementation would constitute a valuable contribution which management can make to the health of the workers. Opponents of the vitamin supplementation program maintain that vitamins (and also minerals) are only some of the dietary factors lacking in adequate diets and that a diet of properly chosen natural foods is the goal desired. Inadequacy of essential proteins and possibly of other unknown factors are also a consideration. They believe that reliance on vitamin pills for assuring an adequate diet will defeat the purpose of nutrition education. There are valid arguments in favor of both views, so that the problem cannot be easily resolved. Some reports of what has been accomplished in practice by feeding vitamin supplements may serve to clarify the situation.

Practical Studies: Among the earlier, *controlled* studies are those of Holmes *et al* (14) who found over a five-year period definite evidence for the value of cod-liver oil (vitamins A and D) in reducing industrial absenteeism caused by colds and respiratory diseases. The

importance of this becomes apparent when it is realized that one of the greatest single causes of time-loss, accounting for more than half the total number of days absent, has been reported to be respiratory disease, i.e., grippe, colds, bronchitis (15). More recently the specialized use of vitamin A supplements has been reported successful as a means of combating retinal fatigue in color-matching inspectors working under artificial light 50 times the intensity of average school room light or about 10 times the average light found in industrial plants (16). Haggard (17) reports:

> "We have made two studies in a large defense plant. In both studies, where all experimental conditions were controlled as rigorously as the conditions of the management permitted, there was a moderate but definite improvement in production by men fed vitamins, a marked decrease in spoilage and accidents, and a considerable decrease in absenteeism."

Fishbein *et al* (20) have recently reported detailed studies on the feeding of vitamin B-complex supplements for about three months to workers presumably not receiving an adequate diet. There were two groups, one receiving vitamins and the other receiving placebos. Any changes in physiological characteristics were noted (constipation, mental alertness, tiredness, eyestrain, number of colds, skin eruptions, appetite and sleep) and classified as favorable, unfavorable or unchanged. For the most part favorable effects were reported with respect to the improvement of all of these conditions, even by those receiving placebos so that the psychological factor must be included in any evaluation of vitamin therapy. Improvements in alertness, tiredness, appetite and sleep usually were more pronounced with the placebos, while the vitamins seemed to be more beneficial with respect to the other complaints. Ruffin and Cayer (21) on the other hand, in a 30-day experiment on a group of medical students and technicians, reported no appreciable beneficial effect of vitamin supplements on such conditions as appetite, energy, general health, and the like. They did find some adverse effects on gastrointestinal symptoms due to the taking of liver and yeast extracts. The short term of their experiment as well as the fact that the medical students were probably obtaining a better diet than the usual industrial worker*, may explain the failure to note improvement upon administration of vitamins in this experiment.

Ten outstanding nutrition authorities have summarized their views on the feeding of vitamin supplements to workers in a recent government publication (18). Most of them prefer natural vitamin-rich foods to vitamin supplements as a means of improving the work-

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*This was confirmed in a random sample of the students who were subjected to clinical vitamin studies prior to the test and found to be in good health with respect to vitamin status.

er's diet – a diet which, all agree, needs improvement. Some of these authorities endorse the use of vitamin pills as a vital expediency, while others – realizing the slowness of achieving improvement with natural foods alone – compromise by suggesting such supplements as brewers' yeast or snacks of milk and fruit.

Fourteen industrial war plants have reported, in the same publication (18) on their practical experiences in providing their employees with vitamin supplements. All are unanimous in reporting excellent employee acceptance of the vitamins. Where multi-vitamin preparations were given all report a large percentage of favorable responses from the employees with respect to improved health and greater resistance to fatigue and colds. Other plants, using only vitamin C or thiamine as protection against industrial toxins, also comment favorably on the results obtained. Most of these reports, of course, represent casual surveys and uncontrolled conditions; they are intended, however, not as scientific experiments, but as uncritical reports of actual practical experiences.

An interesting critique of the situation has been given by Haggard (17):

> "I believe in education as the sound and proper method of improving diet but I do not believe that the principle, however correct, should be used stubbornly to impede war production. There are facts to be considered as well as principles. Can an improvement in factory feeding, in home feeding, in national food habits, be effected before the war effort is over? It is obviously upon this effect that we must concentrate our attention. There was time for education before the war; there will be time after the war; and it can go on during the war. But for the present, our attention is focused, not upon normal, logical and rational conditions but upon the abnormal, illogical and irrational conditions of wartime.
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> "The opposition directed against the use of vitamin supplements is more vigorous than that against fortified foods. The same individuals who object to feeding supplements have themselves advanced and consummated the idea of fortifying ordinary foods with synthetic vitamins, as in the addition of vitamin B_1 to bread. The rationalization seems to be that the milling of bread removes most of the B_1 in wheat and education has failed to lead the public to eat whole wheat bread. Now in the factory where meals are served, the method of preparation, particularly the use of the steam table, removes vitamin B_1 as effectively as does the milling of wheat; therefore, by precedent it should be rational to add vitamin B_1, preferably as brewer's yeast, to the food served in the factory to replace the vitamin lost in preparation. Education has failed, so far, to teach the wife of the factory worker how to provide a fully adequate diet for her husband. Therefore, as in the instance of failure to educate the public to eat whole wheat instead of white flour, it would appear entirely rational to supplement the diet – as white bread is and will be supplemented – until education can progress to the point where such supplementation no longer becomes necessary.

"It would appear that the matter of using vitamin supplements in industry is, today, less a problem requiring scientific study than one requiring the application of some common sense and reasonable logic, and requiring particularly the subordination of preconceived views and interests to the paramount problem of increasing factory production and winning the war now."

Present Nutrition Program:

The campaign for better nutrition among industrial workers has already yielded promising results. Many industrial plants have adopted the practices of providing between-meal milk, fruit juices, nutritious sandwiches and the like. Others have engaged competent dietitians or nutritionists to supervise the planning and preparation of meals. Posters have been used to stress the importance of the protective foods. Lunch "specials" have been designed to provide a balanced selection of foods. Management-owned cafeterias, run for the employees' benefit, have in many cases replaced profit-making concessions featuring poorer selections of foods. A report from the American Telephone & Telegraph Company in New York City (22) is typical of current educational campaigns in industry. Following the inauguration of a vigorous nutrition education campaign among the employees, it was found that requests for salads, milk and more adequate breakfasts increased substantially in the company cafeterias. It is reported, for example, that in one of the dining rooms over five times as many salads are now being sold as were previous to the nutrition program.

The Bridgeport Lunch Box Plan offers an illustration of how organized community activity has succeeded in contributing materially to the nutritional welfare of workers. The plan, sponsored by industrial, municipal and civic groups, was inaugurated in the industrial city of Bridgeport, Connecticut to teach women how to pack adequate, nutritious lunches for their working husbands. The slogan, "Pack a Lunch a Man Can Work On," was devised and a leaflet was prepared suggesting efficient ways of planning and packing foods, and listing about 100 foods that might be used for lunches. Requirements for a "Five-Star Lunch" were:

★ Plan it the day before. Buy or cook enough food for your dinner so there'll be some left over for the lunch box.

★ Have all food and equipment stored in one place so the lunch can be packed quickly in the morning.

★ Wrap all dry food in wax paper; pack puddings and salads in paper containers with lids and include paper "hot-drink" cups for hot dishes.

★Put into the lunch box every day:

MILK: In food or drink.

BREAD: Whole wheat or enriched—in sandwiches, puddings or meat loaves.

MEAT: Cheese, eggs or fish—in sandwich fillings, salads or in hearty main dishes.

FRUIT: At least one. Plain or in salads or puddings.

VEGETABLES: At least one. In sandwich fillings, salads or in hearty main dishes.

★Clean and air the lunch box and vacuum bottle every night.

Health committees, the local press, federal authorities and local manufacturers all contributed to the working of the plan. Demonstrations were given, industrial surveys made, newspaper publicity launched. Early public opposition was soon overcome and replaced with eager enthusiasm when housewives became concerned about the health of their husbands and learned valuable time and money-saving practices in the packing of substantial, nutritious lunches. A dramatic account of the plan, its workings and enthusiastic reception has been given by Beatrice Kneeland (26), co-ordinator of the plan. Its success has stimulated the interest of other communities throughout the country in establishing similar popular appeal campaigns. An outline of the current achievements of the industrial nutrition program has been given by Cowgill (23) and Goodhart (24), while Bing (25) has discussed the general subject of evaluating industrial nutrition practices in a recent symposium on industrial nutrition.

National Research Council Recommendations:

The Committee on Nutrition in Industry of the National Research Council (15) has issued a number of general recommendations to be used as a guide in improving industrial nutrition conditions. Some of these are summarized below:

1. Nutritious meals of natural foods at prices the workers are accustomed to and can afford to pay should be made available in all plants engaged in production for war or defense purposes, except in small plants where the worker may obtain such meals from private sources in the free time at his disposal. Any meal served in the plant should contribute at least one-third of the daily requirements of specific nutrients recommended by the Food and Nutrition Board of the National Research Council.

2. The practice of serving food between meals to workers has given good results and is recommended. Milk, fruit and tomato juices are to be preferred as beverages, and other foods which are served should include the necessary nutrients. Thus, when bread is served it should be enriched white bread or whole grain product.

3. Choice of foods served in the plant should be determined by a trained dietitian or nutritionist. Brief study of workers' diets will enable the dietitian to make up menus calculated to compensate for the ordinary

inadequacies. The employment of a dietitian or nutritionist by the plant is recommended. In cases where this is not feasible, advice may be obtained from the state or local Committee on Nutrition.

4. Suitable educational material should be presented in connection with cafeteria service or supplementary lunches to stimulate acceptance of the meals planned or the selection of good meals when there is a choice of foods. Such material should be so planned as to lead to the development of good health habits and should avoid undue emphasis on any particular food.

5. Measures should be taken by the appropriate subdivision of government to condition nutritionally those classes of the population which are likely to become workers in war or defense industries. Such nutritional conditioning might well be carried out among organized groups such as are found in CCC camps, NYA, WPA and Defense Training Schools. The large percentage of young men found to be unfit for service in the armed forces emphasizes the need for such conditioning, for employment in war industries may be just as strenuous and in far less favorable environment than service in the armed forces. Such work, already under way in this country, should be greatly extended.

6. It is recommended that adequately controlled studies be conducted in selected war or defense industries to determine the facts concerning the influence of diet and nutrition on health, working capacity, incidence of accidents, absenteeism and the psychological state (industrial unrest).

Conclusion:

The newly recognized importance of food and the principles of nutrition as vital factors in health and in the national welfare have been reiterated by numerous government as well as scientific authorities. Practical innovations and educational campaigns to improve the nutritional status of our people, particularly those engaged in energy-consuming, vital war work, have only just begun – these including provision of between-meal snacks of milk, fruit or other wholesome foods, improved methods of large-scale cookery and service, more adequate eating facilities. Preliminary reports have indicated such successful results for the newly-innovated nutrition-in-industry campaign that great hope is held out for future achievements and rewards in the form of increased national health, welfare and productivity.

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NEWS DIGEST

EGGS—Eggs may be kept in good edible condition for as much as a year by means of a new flash heat treatment. The treatment is very simple, and requires only such equipment as may be found in an average kitchen. It consists merely of plunging the eggs in boiling water for five seconds, letting them cool, and putting them away in a refrigerator. Eggs thus treated may even be kept without refrigeration, but they will stay good for only about three months, as contrasted with twelve months in the refrigerator. Cold-storage eggs remain in edible condition for about six months.—*Science 101, Supp. 10* (Feb. 9) 1945.

APPLE TEST—The redder the apples the better they sell. But the right shade of green in the apple-tree's leaves is an indicator of how red the apples will be, since healthy dark-green in leaves and lively red in apple skins both result, in part, from proper adjustment in the amount of nitrogen fertilizer fed to the tree. With this principle in mind careful laboratory studies were made of the color of leaves collected in midsummer from trees under different nutritional conditions. From the spectrophotometer data obtained, a set of seven carefully compounded printing inks was made and used to prepare a chart of seven leaf-green shades. Now all an apple-grower needs to do is hold the chart alongside sample leaves from his trees, and he will get an idea of the status of their nitrogen nutrition. In general, high nitrogen produces apples of large size but poor color; and since color is the deciding sales factor a compromise must be sought between color and size. The work has thus far been confined to one apple variety, the McIntosh. However, since about half the apples raised in New York are of this variety, their studies are considered of particular importance for this State.—*Science 101, Supp. 10* (Feb. 9) 1945.

ASCORBIC ACID IN SCHOOL LUNCHES—A recent school lunch survey reveals that the best sources of ascorbic acid at the end of the food preparation period were: a combination salad of tomato, green pepper, onion, and lettuce, containing 55.25 milligrams per 100 grams, and oranges containing 38.38 milligrams per 100 grams. Other foods which contained 20 or more milligrams ascorbic acid per 100 grams included fruit cup; fruit jello; grapefruit, orange, and pineapple; oranges and prunes; salads composed of cabbage and green pepper, or cabbage, celery and tomatoes, and raw turnip strips. Foods which retained 50 per cent or more of their original ascorbic acid were carrots and peas; fruit cup; fruit jello; grapefruit, orange and pineapple; oranges and prunes; liver, candied sweet potatoes; cabbage salad variations; lettuce and tomato salad; tomato, green pepper, onion, and lettuce salad; and raw turnip strips. When compared with the National Research Council standards, an adequate quantity of ascorbic acid for any age group was furnished by the school lunch on only one day when 96.97 to 98.66 per cent was furnished by an orange served for dessert. Children served at the end of the luncheon period were given food containing 43.66 to 99.68 per cent as much ascorbic acid as those served first. —*Abstr. Jour. Am. Diet. Assoc. 21,* 114 (1945).